lengths falling within a predetermined range. The organic image sensor further comprises a first protective structure disposed between the upper electrode and the organic photoelectrical conversion structure.

In yet other embodiments, the present disclosure relates to a method of forming an organic image sensor. The method comprises forming a first electrode layer over a substrate, and forming an organic photoelectrical conversion structure over the first electrode layer. The method further comprises forming a protective structure covering a top surface of the organic photoelectrical conversion structure using an atomic layer deposition process. The method further comprises forming a first charge blocking layer configured to block a first type of charge over the protective structure, and forming a second electrode layer over the first charge blocking layer

The foregoing outlines features of several embodiments so that those skilled in the art may better understand the aspects of the present disclosure. Those skilled in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes and/or achieving the same advantages of the embodiments introduced herein. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the present disclosure, and that they may make various changes, substitutions, and alterations herein without departing from the spirit and scope of the present disclosure.

What is claimed is:

1. An organic image sensor, comprising:

an organic photoelectrical conversion structure arranged between a first electrode and a second electrode, and configured to convert photons into an electrical signal;

a first charge blocking structure arranged between the first electrode and the organic photoelectrical conversion structure and configured to block a first kind of electric charge;

a second charge blocking structure arranged between the organic photoelectrical conversion structure and the second electrode and configured to block a second kind of electric charge; and

a first protective structure arranged between the second charge blocking structure and the organic photoelectrical conversion structure.

2. The organic image sensor of claim **1**, wherein the first protective structure extends along sidewalls of the organic photoelectrical conversion structure.

3. The organic image sensor of claim **1**, further comprising:

a second protective structure arranged between the second charge blocking structure and the organic photoelectrical conversion structure.

4. The organic image sensor of claim **3**, wherein the second protective structure is a same material with the first protective structure.

5. The organic image sensor of claim **1**, wherein sidewalls of the first electrode are laterally offset from sidewalls of the second electrode.

6. The organic image sensor of claim **1**, further comprising:

a plurality of interconnect structures, wherein the first electrode is positioned between the organic photoelectrical conversion structure and the plurality of interconnect structures.

7. The organic image sensor of claim **1**, wherein the photons have wavelengths falling within a predetermined range, and wherein the second electrode is transparent to the photons have wavelengths falling within a predetermined range.

8. The organic image sensor of claim **1**, wherein the first protective structure comprises aluminum oxide (Al_2O_3), aluminum nitride (AlN), or silicon oxide (SiO_2).

9. The organic image sensor of claim **1**, wherein the second charge blocking structure is configured to block holes.

10. The organic image sensor of claim **1**, wherein the first charge blocking structure is configured to block electrons.

11. An organic image sensor, comprising:

an organic photoelectrical conversion structure configured to convert photons having wavelengths falling within a predetermined range into an electrical signal;

an upper electrode disposed over the organic photoelectrical conversion structure, wherein the upper electrode is transparent to the photons have wavelengths falling within a predetermined range;

a first charge-blocking structure arranged between the upper electrode and the organic photoelectrical conversion structure and configured to block a first kind of electric charge; and

a first protective structure disposed between the first charge-blocking structure and the organic photoelectrical conversion structure.

12. The organic image sensor of claim **11**, wherein the organic photoelectrical conversion structure comprises an organic photo active layer, an organic hole transport layer, and an organic electron transport layer.

13. The organic image sensor of claim **11**, wherein the first protective structure covers a top surface and sidewalls of the organic photoelectrical conversion structure.

14. The organic image sensor of claim **11**, further comprising:

a lower electrode arranged between the organic photoelectrical conversion structure and a substrate; and

a second protective structure arranged between the lower electrode and the organic photoelectrical conversion structure and comprising a same material as the first protective structure.

15. The organic image sensor of claim **14**, further comprising:

a hole blocking structure disposed between the first protective structure and the organic photoelectrical conversion structure and configured to block holes; and

an electron blocking structure disposed between the lower electrode and the organic photoelectrical conversion structure and configured to block electrons.

16. A method of forming an organic image sensor, comprising:

forming a first electrode layer over a substrate;

forming an organic photoelectrical conversion structure over the first electrode layer;

forming a protective structure covering a top surface of the organic photoelectrical conversion structure using an atomic layer deposition process;

forming a first charge blocking layer configured to block a first type of charge over the protective structure; and

forming a second electrode layer over the first charge blocking layer.

17. The method of claim **16**, further comprising:

forming a second charge blocking layer configured to block a second type of charge over the first electrode layer, wherein the second charge blocking layer is formed prior to forming the organic photoelectrical conversion structure.